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SELECTING HENS
for
EGG PRODUCTION



A LARGE NUMBER of eggs produced per bird is one of the most important means of obtaining good returns from poultry. Bred-to-lay stock is of primary importance in obtaining good egg production.

Improper methods of feeding and management of the laying stock interfere with efficient selection.

The proper selection of hatching eggs and young stock is essential if satisfactory egg production is to be obtained from a pullet flock.

Research has indicated that there is no relationship between egg production and the measurements of the head and body. A hen's ability to lay is determined primarily by her breeding.

In selecting the good producers and in culling unprofitable birds, it is necessary to be able to distinguish hens that are laying from those that are not. The condition of comb, wattles, vent, and other parts indicates whether a hen is laying at a particular time. The bleaching of the pigment of the vent, beak, and shanks, the time of year that molting takes place, and the duration of the molting period are useful factors in determining how long birds have been laying. The earning capacity of the flock can be kept at a high level by the frequent elimination of nonlayers.

A few years of intelligent selection, based on the factors mentioned, or the purchase of new stock from sources where such selection is practiced will lead to the development of high-laying strains. The birds will be noteworthy for earliness of sexual maturity, good rate of laying, comparative absence of broodiness, and persistence of production. These four characteristics largely determine the number of eggs produced.

SELECTING HENS FOR EGG PRODUCTION

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RELATION OF SELECTION TO PROFITS FROM POULTRY

FARMERS and commercial poultrymen would get better returns from their flocks if they examined them frequently and removed the unprofitable birds from time to time. Since poultry profits are directly related to egg production, income over feed cost rises much more rapidly than expenses as egg production in a flock increases. Though the cost of maintaining a high-producing flock is somewhat greater than that of maintaining a low-producing flock, the increased production is obtained at a lower cost per dozen eggs.

Selection should begin with the hatching eggs and continue throughout the lifetime of the fowls. Emphasis is placed on the term "selection" rather than on "culling" because "cull" is used to describe two different classes of fowls. Market men, by this term, mean a bird of very low market quality. On the other hand, commercial poultrymen and farmers speak of a "cull" as a poor layer eliminated from the flock. Such culled birds frequently make satisfactory market poultry. Rigid selection of hatching eggs is the first step in building up a profitable flock. Chicks should be hatched only from good-sized eggs of the best layers; select eggs that weigh approximately 2 ounces each. Tinted white eggs and extremely light brown eggs, as well as those irregular in shape or poor in shell texture, are undesirable for hatching purposes. Chicks hatched from such eggs are likely to be a liability to the flock because of low market returns from the eggs.

Remove inferior chicks as soon as they are hatched and continue the practice until the flock is grown. Kill any weak or crippled chicks at hatching time. In order to carry on the selection of the flock most intelligently keep a record of the date the chicks are hatched, so that the age of the birds may be known during the growing season and after maturity. At hatching time the chicks may be toe-punched or banded in the wing or on the leg with a numbered leg band.

The number of unprofitable layers will be considerably reduced if runty and slow-growing birds are eliminated from time to time. Even when this is done it will probably be more profitable to cull out and sell 10 percent of the remaining, late-maturing pullets rather than to place them all in the laying house. Most farmers and commercial poultrymen do not select their young stock rigidly enough.

Close, daily observation of the laying flock during the winter months should enable the poultryman to eliminate the poor layers. In the spring watch for broody hens and either send them to market or band them in the way described later. Some of the adult breeding stock will not be valuable enough to carry over another year and may be marketed. Prices of fowls are usually higher in the spring than late in the summer.

In late June or early July, toward the end of the first laying year, market the early molting birds and any others that are not laying. Continue to do this throughout these 2 months, so that hens will not be kept in the flock after they have stopped laying. Selling the nonlayers during these months has two advantages. One is that, as mentioned above, fowls usually bring less money late in the summer than early in the season on account of increasing supplies of young poultry. The early marketing of nonproducers, therefore, should result in better returns for the fowls sold. The other advantage is the reduction of feed costs for the flock. A hen, whether laying or not, will eat from 6 to 7 pounds of feed a month. A 50-percent production in the flock (an average daily egg production equal to one half the number of hens in the flock) may be maintained during the summer months if the early molters are removed and marketed at regular intervals. Hens laying well in June and July at the end of their first laying year should be kept, since egg prices usually begin to rise during those months. If later examination shows that some of these hens are falling off in production they may be marketed. Hens laying in August and September are the most persistent layers and should be retained for a second year of production and for breeding purposes.

Production during the second laying year is usually about 20 percent less than that during the first year. Because of this fact, it is unprofitable to keep most hens longer than 1 year. On the other hand, some birds in almost every flock will lay enough eggs to be profitable a second year, and a few even a third and fourth year. The usual practice on commercial poultry farms is to retain about 30 percent of the yearling hens. In the general-purpose breeds, particularly in stock not bred to lay, more rigid selection may be practiced since there is a stronger tendency for heavy fowls to put on flesh and lay fewer eggs.

GENERAL BASIS FOR SELECTION

Flocks of poor laying ability need to be more rigidly culled than good flocks. According to the 1930 census, the average annual egg production of all hens in this country is about 90 eggs. There are many farm and commercial flocks that average approximately 150 eggs per bird and a considerable number that average approximately 200 eggs per bird. It is evident that there must be flocks that are below the 90-egg average. Low-producing flocks are relatively unprofitable largely because little or no selection has been practiced.

In order to be fairly profitable, under most conditions, a flock should average approximately 150 eggs per bird, and when proper selection increases that average the profits from the flock will also be increased. One of the most important factors affecting returns from the laying flock is the average number of eggs laid per bird.

In order that the selection of the laying flock may be most effective it is necessary for the birds to be in good health, to be well fed and well managed.

RELATION OF HEALTH TO SELECTION

In order to lay at her best, a bird must be in good health; but even in flocks where good egg production is being obtained, there are usually a few hens that have lost their constitutional vigor through the effects of disease or parasites.¹ A cold may throw a good layer out of production for several weeks. Sometimes birds become so heavily infested with parasites that it is impossible for them to lay well however good their laying ability. It is imperative, therefore, that the owner do everything possible to maintain a high level of constitutional vigor in his flock.

INFLUENCE OF FEEDING ON SELECTION

A good diet is also essential² in obtaining high egg production. A poor diet or an insufficient quantity of a good diet is a serious handicap. On the other hand, liberal feeding of a well-balanced diet will not enable inherently low-producing hens to make good records.

If liberal feeding of a good diet is not practiced it is impossible to tell by their appearance which hens are capable of good production. It is an easy matter to weed out the low producers in a flock that has been properly fed. If only a few hens in a flock stop laying they are likely to be naturally low producers. However, if a large proportion of a flock stops laying within a week, the decline in production is due to other causes, such as improper feeding, disease or parasitic infestation, or radical changes in management.

IMPORTANCE OF GOOD MANAGEMENT

Radical changes in flock management may throw most of the birds in the flock out of production and thus disturb the normal body changes that take place in birds under continuous production. Such a situation reduces the effectiveness of selection very materially. For instance, if artificial lighting of the laying house is used during the short winter days for the purpose of inducing liberal feed consumption and for any reason the lights are discontinued suddenly the flock is likely to be thrown out of production and perhaps into an abnormal molt. Also, if the flock is unduly excited, egg production is sure to be reduced. Then again, if the flock is accustomed to free range and is suddenly confined to the laying house, many of the birds may cease laying for a period. If the birds are deprived of water for a good part of a day, egg production is sure to drop. It is only when the flock is well managed day after day throughout the year that the selection of birds according to their laying ability can be carried out

¹ For information on poultry diseases or parasites see Farmers' Bulletin 1652, Diseases and Parasites of Poultry.

² Detailed information on feeding poultry is given in Farmers' Bulletin 1541, Feeding Chickens.

properly, as most of the principles of selection are based on body changes that take place as a result of normal laying.

SHAPE OF HEAD AND BODY CONFORMATION NOT RELATED TO LAYING ABILITY

Much emphasis has been placed by many poultrymen on the shape of the head as an indication of egg-producing ability. However, research at the United States Animal Husbandry Experiment Station at Beltsville, Md., indicates that there is no relationship between length, breadth, and depth of skull and the number of eggs produced or their weight. Moreover, these experiments show that weight of brain bears no relation to the number of eggs laid by a bird or to the size of her eggs. Shape of head, therefore, often regarded as an indicator of efficiency in production, is of no value in estimating a hen's laying ability.

Emphasis has often been placed also on the length and width of the back throughout its entire length, the depth of the body from the back to the front end of the keel bone, a full breast, good width in the pelvic region, and a so-called "wedge" shape, as indications of a high-producing hen. Angularity in body conformation has also been considered favorable to production. Adequate capacity in the individual to accommodate properly the vital and reproductive organs has been stressed as essential. Although differences in digestive or reproductive capacity may cause variations in production, the ability to lay depends on breeding rather than adherence to any specific type or conformation.

The results of several investigations have shown that live-bird measurements are of relatively little value for classification on the basis of egg-producing ability. Research at Beltsville, Md., has indicated that neither dressed-carass nor skeletal measurements are significantly correlated with egg production in White Leghorns or Rhode Island Reds. Consequently, there seems to be little basis for the contention that there is an egg-laying type in the domestic fowl, type in this case meaning body conformation as indicated by the measurements mentioned.

DISTINGUISHING LAYERS FROM NONLAYERS

In selecting good producers and culling the unprofitable birds, it is necessary to be able to distinguish hens that are laying from those that are not laying. The appearance, size, or shape of the comb and wattles, vent, pubic bones, abdomen, and the lateral processes of the sternum are good indications as to whether a hen is laying.

CONDITION OF COMB AND WATTLES

The comb and wattles serve as a ready means of determining whether a hen is laying. Their color and size indicate the activity or inactivity of the ovaries. The increase in size of the reproductive organs before laying commences is accompanied by an enlargement of the head appendages. When the pullet is about to lay, she has a large, bright-red, smooth, glossy comb, and full, smooth wattles (fig. 1, A).

When production stops the comb shrinks, becomes dull, dry, and shriveled (fig. 1, *B*). The circulation of the blood in the comb and wattles is diminished with the cessation of egg production, causing them to shrink. As the bird comes back into production after a rest period, the expanding comb begins to assume the shiny stiffness associated with production, and the gloss can be seen plainly.

CONDITION OF VENT

The shape of the vent, as well as its size and condition, changes with egg production. The small, round vent of the pullet enlarges and becomes oval or elliptical in shape during the production period. The dilated, smooth, moist vent of the layer is in marked contrast to the shrunken, puckered, dry vent of the nonlayer.

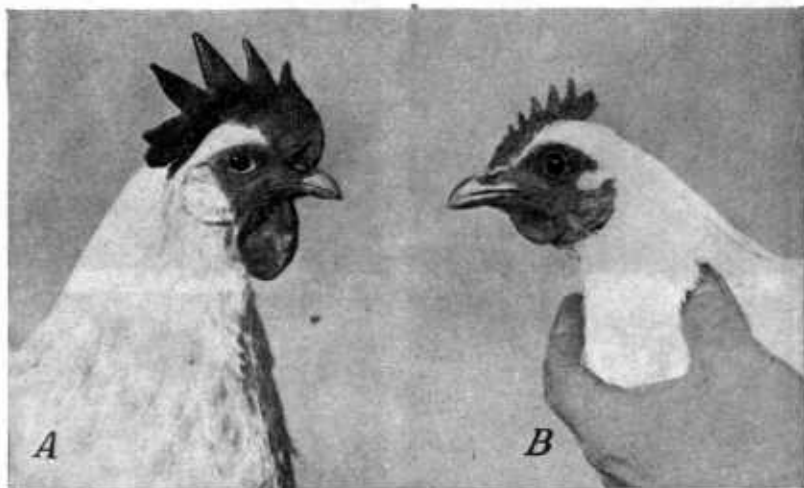


FIGURE 1.—Appearance of comb and wattles of a hen: *A*, In laying condition; and *B*, in nonlaying condition

CONDITION OF PUBIC BONES

The two small bones at the sides of the vent are known as pubic bones. As a fowl comes into laying condition these bones spread apart. The distance between them at this time will be at least $1\frac{1}{2}$ inches, even in small fowls, and may be as much as 3 inches in the larger breeds. A space equal to the width of one finger (about three fourths of an inch) between the pubic bones indicates that the hen is not laying (fig. 2, *A*). A space greater than the width of two fingers usually shows that she is laying (fig. 2, *B*).

Continuous production causes the pubic bones to become thin and pliable. In nonlayers these bones are thick and less flexible. This is caused by the accumulation of fat on the pubic bones during the non-production period. During production there is a gradual disappearance of this fat.

CONDITION OF ABDOMEN

The abdomen of a fowl is the rear section of the body and contains most of the digestive and all the reproductive organs. The size of the abdomen, except in an excessively fat hen, is a good indication of

whether she is laying. The pullet or the nonlaying hen has a depth of only about two fingers between the pubic bones and the keel as shown in figure 2, *C*. As the pullet comes into laying the abdomen expands because of the enlargement of the oviduct and the intestines (fig. 2, *D*). The expanded abdomen of the layer is soft and pliable and is covered with a thin, smooth skin. In the nonlayer the abdomen tends to be hard and contracted, and the skin feels coarse and thick.

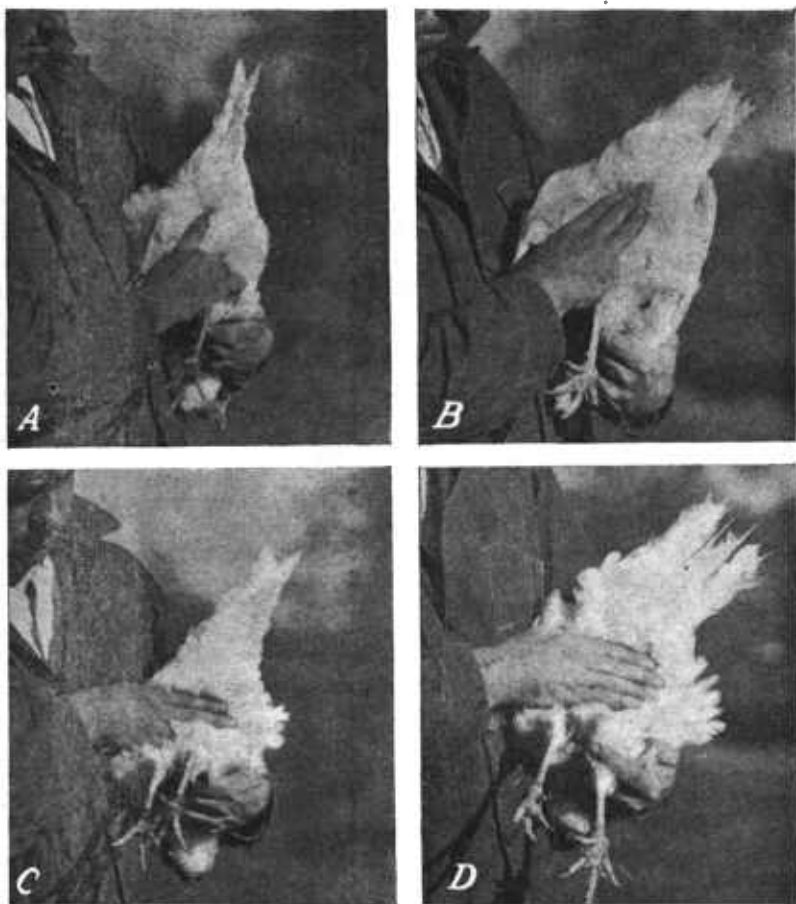


FIGURE 2.—Determining whether a hen is laying by the position of the pubic bones and keel: *A*, Pubic bones close together, indicating that the hen is not laying; *B*, pubic bones far apart, a sign of laying condition; *C*, pubic bones and keel close together, as in a nonlayer; *D*, pubic bones and keel far apart, indicating that the hen is laying.

CONDITION OF LATERAL PROCESSES OF THE STERNUM

The two small bones, one at either side of the body above the rear part of the keel bone or breastbone, are known as the lateral processes of the sternum or sternal processes of the breastbone. These bones are spread apart and forced downward and outward in the laying hen by the increased weight of the internal organs. During heavy production, the sternal processes become very prominent and are

softer and more pliable than previously. When the hen stops laying the ends of the processes are closer together, become stiff, and sometimes are so overlaid with fat that it is difficult to locate them.

DETERMINING PERSISTENT PRODUCERS

The selection of hens should not be based on their present laying condition alone. Allowance should also be made for the time of year, length of laying period, and past performance of the individual. The fact that a hen is laying at the time of examination is no proof that she is a persistent layer. Almost any hen will lay heavily during April and May, but if she is not laying in July or August of the year after she was hatched she is likely to be a poor layer.

Although trap nesting is the only practical way to ascertain the exact number of eggs a hen has laid, there are easily observed changes in physical appearance which reveal whether she has been a good layer. Two of the most useful characteristics indicating previous production are changes in pigmentation and the time of year and duration of the molt.

CHANGES IN PIGMENTATION AS RELATED TO PRODUCTION

Pigmentation, as here discussed, refers to the yellow coloring matter in the skin of yellow-skinned breeds. The degree of bleaching of the pigment is a guide in selecting birds that lay well throughout the year.

At the beginning of the laying period a yellow-skinned pullet carries a supply of yellow pigment which can be seen easily in the vent, eye ring, the white of the ear lobe of breeds having normally white ear lobes, and in the beak, shanks, and toes. When egg production begins the yellow pigment in the feed is diverted from the beak, shanks, and other parts to the yolks of the eggs. The pigment in the feed is used in this way as long as egg production continues, and is not deposited in the skin again until production ceases. While the hen is laying, any pigment already present gradually disappears. This process is known as fading or bleaching of the pigment.

Absence of color in yellow-skinned breeds is an indication of previous egg production, and the degree of fading depends on the length of time the supply of pigment has been diverted. The natural order of the bleaching of the different parts of the body most visibly affected is first the vent, then the eye ring and ear lobe, and later the beak and shanks.

BLEACHING OF THE VENT

The color of the skin around the edges of the vent changes rapidly with egg production. When a yellow-skinned pullet begins to lay, the color fades from the vent and may disappear within a few days. Usually, the vent will be entirely bleached within 15 days. A white, pink, or bluish-white vent indicates that a hen is laying, and a yellow vent shows that she is not laying. The bluish-white vent indicates that production has continued for a longer period.

BLEACHING OF THE EYE RING AND EAR LOBE

The bleaching of the eye ring begins very soon after that of the vent and is usually completed in from 2 to 3 weeks after the hen commences to lay. The ear lobe usually loses its yellow tint in from

3 to 4 weeks. In the Leghorn varieties, a bleached ear lobe indicates a slightly longer period of previous production than a bleached vent or eye ring.

BLEACHING OF THE BEAK

The color of the beak fades from the base to the tip, changing from yellow to white in about 6 weeks of continuous egg production. The bleaching of the lower part of the beak or mandible takes place somewhat more rapidly than that of the upper. The bleaching of the lower mandible can be used as a basis for selection when the upper mandible is dark horn in color, as frequently seen in the Barred Plymouth Rock or Rhode Island Red. In the larger breeds the bleaching of the beak may take somewhat longer than in the Leghorn or the Ancona as there is usually a larger supply of body fat present when egg production begins. Even birds of this class, however, will have fully bleached beaks after 2 months of heavy production.

BLEACHING OF THE SHANKS

The bleaching of the shanks takes place much more slowly than the bleaching of the beak and is a good indication of long-time production. The color recedes first from the lower edge of the scales on the front of the shanks; with continued production the yellow color disappears from the rear of the shanks until little pigment is left except in the scales of the hock joint. From 2 to 5 months of continuous egg production are required to bleach the shanks completely.

REAPPEARANCE OF PIGMENT

When a hen stops laying, the yellow color comes back quickly if the right kind of feed is supplied. The color reappears in the same order as that in which it bleaches.

OTHER FACTORS AFFECTING PIGMENTATION

The density or depth of yellow color possessed by a bird before laying begins is influenced by various factors of its environment, health, and individuality. Among these are the feed supply and general management, size and age of the bird, broodiness, thickness of the skin, and individual vitality. The color in the shanks and beak of yellow-skinned fowls may vary from a deep orange yellow to creamy white. Large quantities of green feed and yellow corn in the mash and scratch rations tend to produce highly colored shanks. The extent of yard range as well as the kind of soil affect the supply of green feed, which in turn affects the supply of pigment. The skin of a large, fat bird bleaches out more slowly than that of a small, thin one.

Periods of broodiness also influence pigmentation, since during these periods the yellow color returns to the skin and beak. Persistence in laying has the opposite effect. The 200-egg pullet does not entirely recover her color as a yearling and consequently bleaches out more quickly in her second year of production. Thickness of skin is also a cause of slower bleaching in birds of the larger breeds as well as in individual Leghorns. Low vitality, disease, or run-down condition prevents the accumulation of body fat, a fact which results in bleached shanks. Finally, radical changes in flock management may stop egg production and thus increase pigmentation.

THE MOLT IN RELATION TO PRODUCTION

The time of year and duration of the molt are important points to consider in selecting high-producing hens. The early molter, as previously stated, is usually a poor layer. Furthermore, the hen that takes a long time for molting is a poor layer because her period of production is thereby reduced.

The annual molt takes place during the summer and fall months toward the close of each year of laying. Poor producers frequently stop laying in June or July and begin to drop their feathers. They usually take a long time to complete their molt and as a rule lay no eggs during this period. Extremely early molters are often out of production from 4 to 6 months and usually do not lay until December or January. Late molters, after a rest of only 2 or 3 months, also begin to lay in December or January.

It takes about 6 weeks for a feather to grow out in either a low or a high producer, but the latter grows more feathers at a time, thereby completing the molt more quickly than a low producer. Trap-nest records show that some very high-producing hens take only a 4- or 5-week rest period. Exceptionally persistent birds sometimes have even shorter rest periods, production continuing during August, September, October, and November. Hens of this type usually begin to lay again before the new plumage is fully grown out. A hen must have good health and good body weight to grow feathers and produce eggs at the same time. Special effort, therefore, should be made to keep the laying flock in good flesh during the summer and fall months.

The use of artificial lights to lengthen the hen's working day and the feeding of moist mash may stimulate feed consumption, which tends to keep up body weight and egg production in a flock in which some birds are beginning to molt. If the hens lose weight too rapidly for any reason they may molt earlier than usual. Prime physical condition and maintenance of body weight are essential factors in warding off the molt.

THE ORDER OF MOLTING

When the hen is molting, the feathers on different parts of the body usually are shed in the following order: Head, neck, breast, body, wings, and tail. In some individuals a few tail feathers may be shed before the wing feathers. Shortly after the old feathers are dropped the new ones come in.

After a short period of production, early hatched or early maturing pullets sometimes have a partial molt in the fall of the year in which they were hatched. Neck and tail feathers and 1 or 2 primaries (the stiff, flight feathers seen on the outer part of the wing when it is spread out) may be shed during this molt; but the new primaries do not grow out to full length, and there is a break between the old and the new ones. During this molting period egg production usually stops. To avoid this period of nonproduction, many poultrymen try to keep the very early hatched pullets from going through a partial molt (fig. 3). It is exceedingly difficult to check the partial molt but it may be avoided by hatching at a later date. If, for example, a large proportion of the March-hatched Leghorn pullets go through a partial molt, the hatching date the following year could be postponed until April.

If the selection of layers is made in August or September, toward the close of the first laying year, the condition of the plumage is good evidence as to whether the birds are persistent layers. The plumage of the good layers shows wear and tear from constant visits to the nest and is usually soiled. The early molting hens will have a growth of new feathers. The webs of the new feathers are glossy and bright in contrast to the dry, frayed webs of the old ones. The new quills are large, full, and soft; the quills of the old feathers are small, hard, and almost transparent. A few pinfeathers in the neck may indicate



FIGURE 3.—Rhode Island Red pullet showing partial molt on January 1 of her pullet year. Note appearance of new neck feathers and absence of tail. The first year's record of this pullet was 233 eggs; second year, 202 eggs.

a short molting period, but when shedding extends to the body and wings the molt usually becomes a complete one.

A hen usually stops laying when molting the wing feathers but may lay while molting in other parts of the body. However, if the body weight is maintained, exceptionally high-producing hens may continue laying until the wing molt is considerably advanced.

ESTIMATING LENGTH OF MOLTING PERIOD

It is possible to estimate when the molt began by counting the primary feathers in the wing. As already stated, the primary feathers

are the stiff flight feathers seen on the outer part of the wing when it is spread out. The secondaries are also large and stiff, but they are found on the inner part of the wing and close to the body of the bird when the wing is folded in its natural position. The primaries are separated from the secondaries by a much shorter feather, known as the axial feather, which grows out at the wing joint.

There are usually 10 primary feathers in each wing, and when the general, or body, molt begins the first primary to be dropped is the inner one next to the axial feather. In the case of the early molter, 2 weeks after the first primary is dropped the second one is shed, and at 2-week intervals each subsequent primary drops. In order to estimate the time elapsing since the molt began, 6 weeks should be allowed for the first mature new primary feather and 2 weeks for each additional full-grown one. Thus a wing having four new full-grown primaries would show that the hen had been molting 12 weeks. If the molt has just begun and none of the primaries are as yet fully grown out, calculation must be made on their present growth. Two thirds of this growth is made during the first 3 weeks, and the other third during the last 3 weeks. A half-grown primary, then, would indicate about 2 weeks of growth.

There is little difficulty in distinguishing the new primary feathers from the old ones. The new feathers

are clean and bright with a soft quill and broad outline. The old primaries are much more pointed in shape and are rather worn.

The way in which the wing molt takes place in the low-producing, early molting hen applies in a general way to the high-producing, late-molting hen. The chief difference is in the rapidity of the molt. The low producer and early molter is a much slower molter than the high producer and late molter.

The primaries of the high producer are molted rapidly and in a manner similar to that of the body plumage. Instead of being renewed one at a time, as in the early molter, a group of two or more primaries of the same length may be growing in at the same time (fig. 4). When such a condition is found, all the new feathers of the same length are considered as one in calculating the length of time



FIGURE 4.—Wing in which five primaries (A) are growing out at one time. Multiple production of primary feathers is an indication of rapid molting and good laying ability.

that has elapsed since molting began. Many high-producing hens do not molt all the primary feathers but continue to carry some of the old ones into the next year. By growing the primaries in groups of two or more or carrying over the old primaries, many high producers materially shorten the time necessary to complete their wing molt.

DEVELOPING A HIGH-LAYING STRAIN THROUGH SELECTION

By adopting a program of selection based on the information already given, the flock owner should be able to increase the efficiency of his flock materially, especially if he eliminates the poor layers from time to time throughout the year. Over a period of years he should develop a permanent selection program that will tend to develop a high-laying strain.

Investigational work at the experiment station at Beltsville has shown that a continuous program of this kind will lead to the development, in a few years, of a high-laying strain, most of the members of which will possess the following four characteristics: (1) Early sexual maturity, (2) good rate of laying, (3) comparatively little broodiness, and (4) persistence of egg production.

EARLINESS OF SEXUAL MATURITY

Since highest prices for eggs are obtained during the fall months, the poultry raiser should strive to hatch his birds early enough to have them laying in September, October, or November. With early maturing stock he should have no difficulty in obtaining good production during the fall months. The best individuals in any flock mature relatively early (at less than 7 months of age) and consequently begin to lay early. These early laying pullets usually lay steadily throughout the year and even late the following fall. Poor individuals, on the other hand, are late-maturing birds that begin to lay late (at from 8 to 9 months of age) and stop early the following summer.

It has been demonstrated at Beltsville that pullets hatched between March 15 and May 8 will lay best throughout their first laying year if they commence in August, September, or October. The data were obtained from flocks of Single-Comb White Leghorns and Rhode Island Reds in which all the birds were allowed to complete their first-year records. The average production of both flocks was approximately 193 eggs per hen. The first year's egg production of each bird included the number of eggs laid in 365 days from the date on which the first egg was laid.

A farmer can detect the early maturing pullets by observing the development of the comb and wattles, the condition of the vent, and the distance between the pubic bones. The early-maturing pullet usually has close-fitting plumage, and there is no excessive fluffiness on the thighs and above the wings (fig. 5). Abundant and loose feathering over the body and abdomen and extremely long, narrow feathers are indications of late maturity and low egg production.

The early maturing birds should be selected and identified by the use of leg bands. For instance, pullets that begin to lay before the first of December may be banded with red celluloid or numbered leg bands. Late-maturing birds may be removed at any time, but if left in the flock they should be marketed when they begin to molt the

following June or July. Birds that begin to lay late in the fall usually stop laying early in the summer.

In any group of early maturing birds, there are usually a few individuals considerably below standard weight for the breed. These may be extra early maturing pullets that came into laying before attaining proper size. Some of these small birds may be layers of small eggs and if so should be eliminated in order to increase the average size of eggs from the flock.

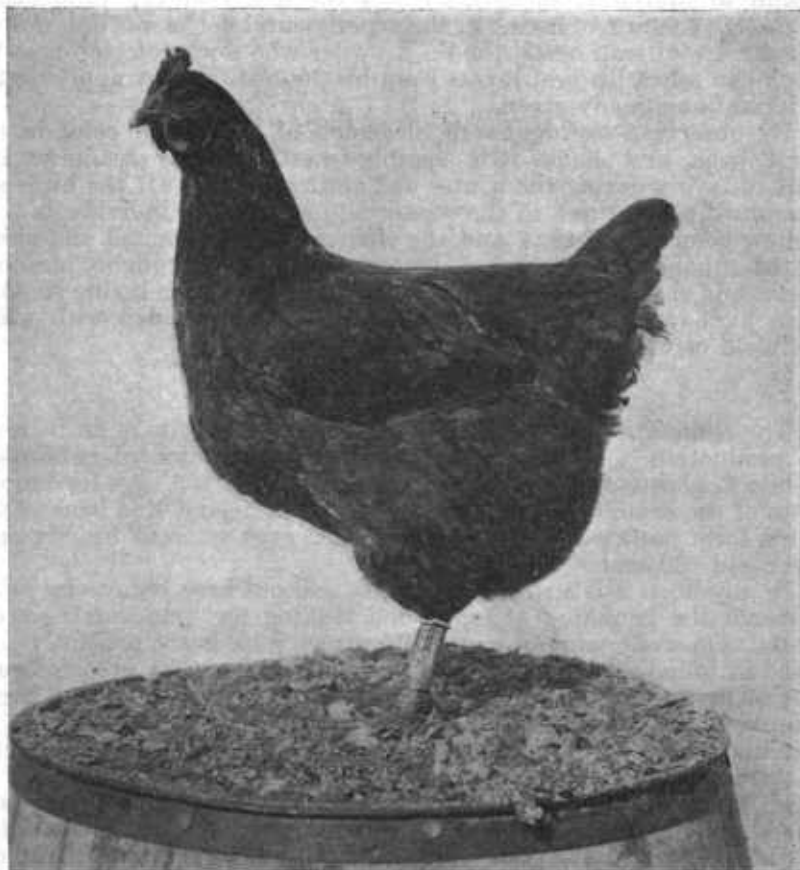


FIGURE 5.—A Rhode Island Red hen which matured early (191 days from hatching date). She laid 232 eggs during her first laying year.

GOOD RATE OF LAYING

Rate or intensity of laying may be defined as the number of eggs laid in a unit of time, such as a week, a month, or the winter or spring period. Another way of expressing rate of laying is by the length of the clutch, which represents continuous production for successive days. Good annual records are made by pullets which lay at a high rate throughout the year.

In the Beltsville flocks of White Leghorn and Rhode Island Red pullets referred to previously, there was a direct relationship between

rate of laying and the number of eggs laid during the first year of egg production. The rate of laying was determined by counting the number of eggs laid by each pullet from the time she laid her first egg to March 1, dividing the number by the total number of days in the same period, and multiplying the product by 100. This gives the percentage of the bird's egg production from the time laying began to March 1.

It was found that the higher the rate of laying from the time laying began to March 1, the greater was the first-year egg production. Although the rate of laying in the experimental flocks was determined by the use of trap nests, the flock owner who does not trap-nest his flock can select his best layers from his poorest ones by applying the information already given.

By observing the degree of bleaching of the yellow color in the vent, beak, and shanks it is possible to estimate the steadiness and rate of laying during the winter and spring months. If the birds are examined a few times in the winter and spring, the individuals with yellow color in the beak and the shanks can be detected and eliminated or banded to be marketed later. The most thoroughly bleached beaks and shanks will be found in hens that have been laying steadily at a high rate. These should be retained and banded with white celluloid or with numbered leg bands.

ABSENCE OF BROODINESS

The elimination of broody hens from a flock results in an increase in production. At Beltsville the average production of nonbroody White Leghorns was 194 eggs as compared with 153 eggs for broody ones of the same breed. In a flock of Rhode Island Red hens at the same farm nonbroody hens averaged 205 eggs whereas broody ones averaged 180 eggs.

In any flock it is a simple matter to cull out broody hens by going through the henhouse at night and looking for "cluckers" on the nests. On well-managed poultry farms such birds are promptly confined in broody coops until their broodiness ceases. A broody hen is out of production about 2 weeks on the average even though she is "broken up" at once. Since broodiness is an inherited trait its elimination from breeding flocks may be accomplished by consistently discarding broody individuals.

If, however, the flock owner depends on hens for hatching and brooding chicks it is advisable to save for incubation purposes a few of the hens that have gone broody. But keeping more of these hens than is necessary to incubate the desired numbers of eggs is wasteful. When early chicks or large numbers of chicks are wanted, the incubator is almost a necessity, in which case all broody hens may be marketed at the end of the laying season. Broody hens not desired for incubating eggs should be banded with black celluloid or numbered leg bands and marketed at the proper time.

PERSISTENCE OF EGG PRODUCTION

In order to be most profitable as an egg producer a bird must continue to lay well toward the close of her first laying year. At the experiment station at Beltsville the birds which laid best during August and September, at the end of the first laying year, were the best producers (figs. 6 and 7).

Hens that are laying well in August and September have bleached vents, beaks, and shanks, and usually have worn plumage and show no indications of molt; nonpersistent layers usually have yellow vents, beaks, and shanks, are early molters, and have begun to grow new feathers. Farmers and commercial poultrymen can easily select the most persistent layers by picking out the hens that are laying heavily in August and September and banding them with blue celluloid or numbered leg bands.

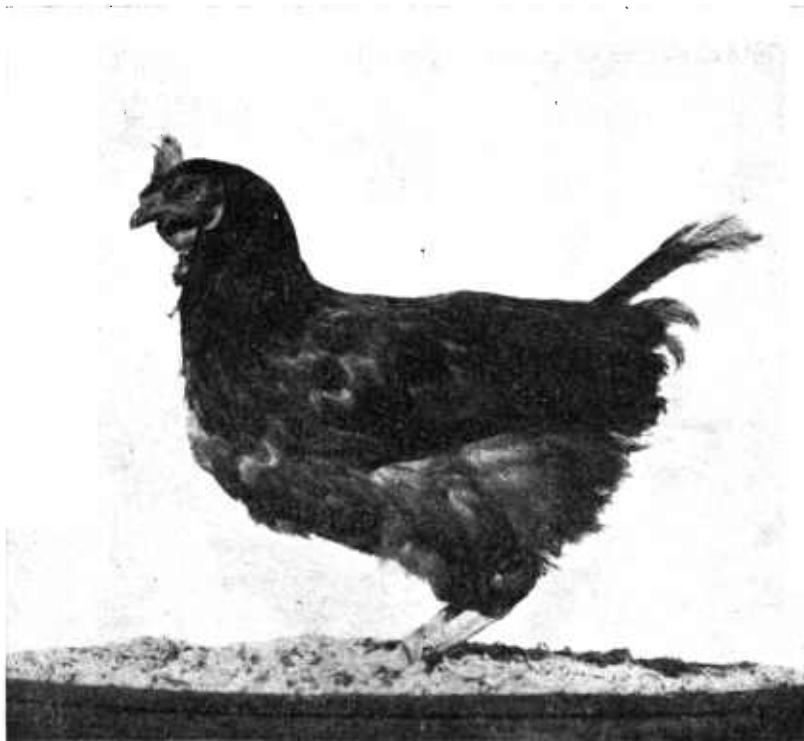


FIGURE 6.—Rhode Island Red hen that laid 49 eggs in August and September toward the end of her first laying year. Her record during the first year was 310 eggs, second year 218 eggs, and third year 129 eggs up to June 1. She is shown in full molt in December after 13½ months of steady laying. This hen matured early (172 days), laid at a high rate, was nonbroody, and a persistent layer.

A PRACTICAL SYSTEM OF BANDING

Farmers and poultrymen who do not trap-nest their birds can adopt a very practical method of selecting the best layers from year to year as follows: As previously suggested, use red leg bands for birds that commence laying early, white leg bands for birds that lay at a good rate, black leg bands for birds that go broody, and blue leg bands for birds that are persistent layers. The birds with red, white, and blue bands are the most profitable layers, and the best of them should be kept for future breeding purposes to improve the egg production of the flock from year to year.

HANDLING THE BIRDS

The removal of low-producing hens from a flock may be simplified by the use of a catching hook or net, or by a catching crate as shown on the cover of this bulletin. In a large flock particularly the hook is not always satisfactory because the layers may be badly frightened by the struggles of captured birds. There is also danger of the hook bruising or injuring the leg when a bird tries to escape. A catching crate is a necessary part of the poultryman's equipment for catching and holding the birds when large numbers are being examined. The flock should be confined to the house and driven through the runway exit into the crate as quietly as possible.

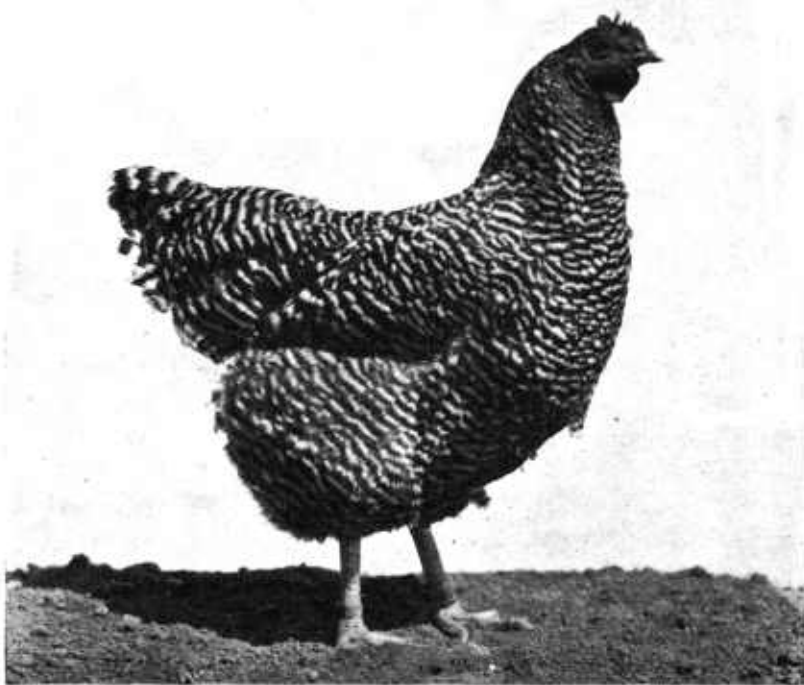


FIGURE 7.—Another high-producing hen. This Barred Plymouth Rock laid 288 eggs during her first laying year, and 204 during the second. She commenced laying relatively early in life, laid at a good rate, was nonbroody, and a persistent producer.

SELECTION CALENDAR AND CHART

June, July, August, and September are the best months for the annual selection of the laying flock because at that time it is easy to distinguish the good from the poor producers. It is highly advantageous, however, for the flock owner to practice selection during every month of the year. Accordingly, the following calendar is offered together with reminders for the selection of both hens and pullets. In the selection chart the characteristics of layers and nonlayers are summarized, together with those of a high-laying strain.

SELECTION CALENDAR

- JANUARY . . .** Keep hens that complete their annual molt this month. Band, as good layers, pullets with well-bleached beaks and shanks.
- FEBRUARY . . .** Select hatching eggs and baby chicks with great care. Continue to band pullets that have thoroughly bleached beaks and shanks.
- MARCH** Market nonlaying hens and pullets that have yellow beaks and shanks. Break up broody hens and leg-band them for marketing later, unless it is necessary to use them for incubation.
- APRIL** Continue to market hens and pullets with yellow beaks and shanks, if not laying. Market broody hens that wear a leg band indicating previous broodiness.
- MAY** Market old breeders not valuable enough to keep for another year. Watch for early molters; they are usually low producers. Remember that market prices for fowls are usually better at this time than later.
- JUNE** Market early molters, thereby reducing feed costs. Try to maintain a 50-percent production during the summer months. Begin annual selection this month.
- JULY** Continue marketing molters. Early molters are usually slow molters. Market slow-growing pullets.
- AUGUST. . . .** Keep hens that are still laying this month. Market those which are well into the molt. Remove weak and unthrifty pullets from the growing flock.
- SEPTEMBER . .** Band, as persistent producers, hens that molt late this month or that have laid throughout the month. Band, as good producers, all pullets that begin laying this month.
- OCTOBER . . .** Continue to band hens that begin to molt during this month and those that are still laying. Continue to select and band the early maturing pullets.
- NOVEMBER . .** Make up breeding pens comprising hens that matured early, laid at a good rate, were nonbroody, and showed persistent production. Early hatched pullets that began laying this month will be fair producers. Late-hatched pullets that come into laying this month will be good producers.
- DECEMBER . .** Band, as good layers, pullets that now have bleached beaks and show some bleaching in shanks. Early hatched pullets that begin to lay late this month will be poor layers. Hens that molt this month are persistent layers and may be kept for another year.
- ANY MONTH.** Remove all birds showing weakness or disease.

SELECTION CHART

Characteristics Identifying Layers and Nonlayers

Character	Condition in a—	
	Layer	Nonlayer
Comb.....	Large, bright red, smooth, glossy.	Dull, dry, shriveled, scaly.
Face.....	Bright red.....	Yellow tint.
Vent.....	Enlarged, smooth, moist..	Shrunk, puckered, dry.
Pubic bones.....	Thin, pliable, spread apart.	Blunt, rigid, close together.
Abdomen.....	Expanded, soft, pliable...	Contracted, hard, fleshy.
Lateral processes.....	Prominent, pliable.....	Hard to find, stiff.
Skin.....	Soft, loose.....	Thick, underlaid with fat.

Characteristics Indicating Whether Previous Production Was Continuous or Brief

Character	Condition associated with—	
	Continuous laying	Brief laying
Vent.....	Bluish white.....	Yellow tint or flesh color.
Eye ring and ear lobe.	White.....	Tinted with yellow.
Beak.....	White.....	Tinted with yellow.
Shanks.....	White, rather flattened...	Yellow, round.
Plumage.....	Worn, soiled.....	Not much worn.
Molting.....	Late, rapid.....	Early, slow.

Characteristics of a High-Laying Strain

Time of maturity..... Laying begins at about 6 months of age in the case of Leghorns and at about 7 months in the case of Rhode Island Reds, Plymouth Rocks, and similar breeds.

Rate of production..... Average of 180 or more eggs a year.

Broodiness..... Birds are seldom broody.

Persistence of production.. Hens are laying well in August and September toward the end of the first laying year or after it is completed.